

*This listing of claims will replace all prior versions, and listings, of claims in the application:*

**Listing of Claims:**

**Claim 1 (Original):** An image output system comprising an image processing device that makes image data subjected to a preset series of image processing and an image output device that creates dots according to a result of the preset series of image processing to form an output image on an output medium,

said image processing device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group;

a correlation map storage module that stores a correlation map correlating dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group; and

a dot number data supply module that refers to the stored correlation map to generate dot number data of each pixel group and supplies the generated dot number data of each pixel group to said image output device,

said image output device comprising:

a pixel position determination module that stores a priority order of dot-on pixels in one pixel group and determines positions of dot-on pixels in each pixel group based on the priority order of dot-on pixels and the supplied dot number data of the pixel group; and

a dot creation module that actually creates dots at the determined positions of dot-on pixels on the output medium.

**Claim 2 (Original):** An image output system in accordance with claim 1, wherein said image output device further comprises a priority order storage module that stores multiple different priority orders of dot-on pixels in one pixel group,

said pixel position determination module receiving the supplied dot number data of each pixel group and selecting one priority order for the pixel group among the multiple different priority orders to determine the positions of dot-on pixels in the pixel group.

**Claim 3 (Original):** An image output system in accordance with either one of claims 1 and 2, wherein said image processing device further comprises a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the image and allocates the pixel group classification number to each pixel group, and

the correlation map stored in said correlation map storage module correlates dot number data of each pixel group to a combination of the pixel group classification number and the pixel group tone value of the pixel group.

**Claim 4 (Original):** An image output system in accordance with claim 3, wherein said classification number allocation module allocates the pixel group classification number to each pixel group, based on a relative position of the pixel group to a dither matrix, which includes multiple threshold values in a two-dimensional arrangement and is applied to the image,

said correlation map storage module generates the dot number data of each pixel group, which represents the number of dots to be created in the pixel group, by dither technique that applies the dither matrix to each pixel in the pixel group on the assumption that all the pixels in the pixel group have an identical pixel group tone value, and stores the generated dot number data in relation to a combination of the pixel group classification number and the pixel group tone value of the pixel group,

said priority order storage module divides the dither matrix into plural blocks according to the pixel group classification number of each pixel group and stores the multiple different priority orders of dot-on pixels, where each priority order is set according to threshold values in one of the plural blocks and is allocated to one pixel group classification number, and

said pixel position determination module selects a priority order of dot-on pixels corresponding to a pixel group classification number allocated to an object pixel group as a target of pixel position determination and determines the positions of dot-on pixels.

**Claim 5 (Original):** An image processing device that makes image data subjected to a preset series of image processing and generates the processed image data as control data, which is supplied to an image output device to control creation of dots and form an output image,

said image processing device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural adjacent pixels, according to image data of individual pixels in the pixel group;

a correlation map storage module that stores a correlation map correlating dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group; and

a dot number data supply module that refers to the stored correlation map to generate dot number data of each pixel group and supplies the generated dot number data of each pixel group to said image output device.

**Claim 6 (Original):** An image processing device in accordance with claim 5, said image processing device further comprising:

a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group,

wherein the correlation map stored in said correlation map storage module correlates dot number data of each pixel group to a combination of the pixel group classification number and the pixel group tone value of the pixel group.

**Claim 7 (Original):** An image processing device in accordance with claim 6, wherein said classification number allocation module converts a resolution of the image data to make a pixel size identical with a size of each pixel group and allocates the pixel group classification number to each pixel with the converted resolution according to a relative position of the pixel in the output image, and

said pixel group tone value specification module specifies a tone value of the image data in each pixel with the converted resolution as the pixel group tone value of the pixel.

**Claim 8 (Original):** An image processing device in accordance with any one of claims 5 through 7, wherein said correlation map storage module stores dot number data of each pixel group, which represents a combination of numbers of multiple different types of dots having different expressing tone values to be created in the pixel group, in relation to a combination of the pixel group classification number and the pixel group tone value of the pixel group.

**Claim 9 (Original):** An image processing device in accordance with any one of claims 5 through 7, wherein said pixel group tone value specification module collects 4 pixels in a main scanning direction and either 2 pixels or 4 pixels in a sub-scanning direction to each pixel group and specifies the pixel group tone value of the pixel group.

**Claim 10 (Original):** An image output device that creates dots on an output medium according to image data to form an output image,

said image output device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural adjacent pixels, according to image data of individual pixels in the pixel group;

a correlation map storage module that stores a correlation map correlating dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

a dot number data generation module that refers to the stored correlation map to generate dot number data of each pixel group;

a pixel position determination module that stores a priority order of dot-on pixels in one pixel group and determines positions of dot-on pixels in each pixel group based on the priority order of dot-on pixels and the supplied dot number data of the pixel group; and

a dot creation module that actually creates dots at the determined positions of dot-on pixels on the output medium.

**Claim 11 (Original):** An image output device in accordance with claim 10, said image output device further comprising:

a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group,

wherein the correlation map stored in said correlation map storage module correlates dot number data of each pixel group to a combination of the pixel group classification number and the pixel group tone value of the pixel group.

**Claim 12 (Original):** An image output method that makes image data subjected to a preset series of image processing and creates dots on an output medium according to the processed image data to form an output image, said image output method comprising:

a first step of specifying a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural adjacent pixels, according to image data of individual pixels in the pixel group;

a second step of storing a correlation map correlating dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

a third step of referring to the stored correlation map to generate dot number data of each pixel group;

a fourth step of storing a priority order of dot-on pixels in one pixel group and determining positions of dot-on pixels in each pixel group based on the priority order of dot-on pixels and the supplied dot number data of the pixel group; and

a fifth step of actually creating dots at the determined positions of dot-on pixels on the output medium.

**Claim 13 (Original):** An image processing method that makes image data subjected to a preset series of image processing and generates the processed image data as control data, which is supplied to an image output device to control creation of dots and form an output image,

said image processing method comprising:

a step (A) of specifying a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural adjacent pixels, according to image data of individual pixels in the pixel group;

a step (B) of storing a correlation map correlating dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group; and

a step (C) of referring to the stored correlation map to generate dot number data of each pixel group and supplying the generated dot number data of each pixel group to said image output device.

**Claims 14-27 (Canceled).**

**Claim 28 (Original):** An image output system comprising an image processing device that makes image data subjected to a preset series of image processing and an image output device that creates dots according to a result of the preset series of image processing to form an output image on an output medium,

said image processing device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group; and

a dot number data supply module that refers to a first correlation map to generate dot number data of each pixel group and supplies the generated dot number data of each pixel group to said image output device, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group,

said image output device comprising:

an ordinal number storage module that stores ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group;

a dot on-off state determination module that receives the dot number data of each pixel group and refers to a second correlation map to determine a dot on-off state in each pixel included in the pixel group, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number; and

a dot creation module that actually creates dots on the output medium according to a determination result of the dot on-off state in the number of pixels.

**Claim 29 (Original):** An image output system in accordance with claim 28, wherein said image processing device further comprises a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group.

**Claim 30 (Original):** An image processing system comprising a first image processing device that makes image data subjected to a preset series of image processing and a second image processing device that generates control data, which is used for controlling dot creation on an output medium to form an output image, according to a result of the preset series of image processing,

said first image processing device comprising:

one value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group; and

a dot number data supply module that refers to a first correlation map to generate dot number data of each pixel group and supplies the generated dot number data of each pixel group to said second image processing device, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group,

said second image processing device comprising:

an ordinal number storage module that stores ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group; and

a control data generation module that receives the dot number data of each pixel group and refers to a second correlation map to determine a dot on-off state in each pixel included in the pixel group and thereby generate the control data, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number.

**Claim 31 (Original):** An image processing system in accordance with claim 30, wherein said ordinal number storage module stores multiple different priority orders of dot-on pixels in one pixel group and stores ordinal numbers of respective pixels in each pixel group in relation to each of the multiple different priority orders, and

said control data generation module selects one priority order for each pixel group among the stored multiple different priority orders, and uses the ordinal numbers stored in relation to the selected priority order to determine a dot on-off state in each pixel included in the pixel group and generate the control data.

**Claim 32 (Original):** An image processing system in accordance with either one of claims 30 and 31, said first image processing device further comprises a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group.

**Claim 33 (Original):** An image processing system in accordance with claim 32, said classification number allocation module allocates the pixel group classification number to each pixel group, based on a relative position of the pixel group to a dither matrix, which includes multiple threshold values in a two-dimensional arrangement and is applied to the image,

said dot number data supply module generates the dot number data of each pixel group, which represents the number of dots to be created in the pixel group, by dither technique that applies the dither matrix to each pixel in the pixel group on the assumption that all the pixels in the pixel group have an identical pixel group tone value, and stores the



generated dot number data in relation to a combination of the pixel group classification number and the pixel group tone value of the pixel group as the first correlation map,

said ordinal number storage module divides the dither matrix used for generation of the dot number data into multiple blocks corresponding to the multiple pixel groups, specifies an order of pixels in each pixel group based on a magnitude relation of threshold values in a block corresponding to the pixel group, and stores the specified order of pixels as one of the multiple different priority orders of dot-on pixels, and

said control data generation module selects one priority order corresponding to position of each pixel group on the image and determines the dot on-off state in each pixel included in the pixel group to generate the control data.

**Claim 34 (Original):** An image processing system in accordance with claim 33, wherein the dither matrix used in said classification number allocation module, said dot number data supply module, and said ordinal number storage module is a matrix having a blue noise mask characteristic.

**Claim 35 (Original):** An image processing system in accordance with claim 33, wherein the dither matrix used in said classification number allocation module, said dot number data supply module, and said ordinal number storage module is a matrix having a green noise mask characteristic.

**Claim 36 (Original):** An image processing system in accordance with claim 32, wherein said classification number allocation module converts a resolution of the image data to make a pixel size identical with a size of each pixel group and allocates the pixel group classification number to each pixel with the converted resolution according to a relative position of the pixel in the output image, and

said pixel group tone value specification module specifies a tone value of the image data in each pixel with the converted resolution as the pixel group tone value of the pixel.

**Claim 37 (Original):** An image processing system in accordance with either one of claims 30 and 31, wherein said dot number data supply module stores a relation relating each combination of the pixel group classification number and the pixel group tone value to dot number data of each pixel group, which represents a combination of numbers of multiple

different types of dots having different expressing tone values to be created in the pixel group, as the first correlation map, and

said control data generation module stores a relation relating each combination of an ordinal number and a value of the dot number data to a dot on-off state including a dot type to be created in a pixel having the ordinal number, as the second correlation map.

**Claim 38 (Original):** An image processing system in accordance with either one of claims 30 and 31, wherein said pixel group tone value specification module specifies the pixel group tone value of each pixel group, which consists of 4 to 16 pixels in a preset positional relation.

**Claim 39 (Original):** An image output device that creates dots on an output medium according to image data to form an output image,

said image output device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group;

a dot number data generation module that refers to a first correlation map to generate dot number data of each pixel group, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

an ordinal number storage module that stores ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group;

a dot on-off state determination module that refers to a second correlation map to determine a dot on-off state in each pixel included in each pixel group with the generated dot number data, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number; and

a dot creation module that actually creates dots on the output medium according to a determination result of the dot on-off state in the number of pixels.

**Claim 40 (Original):** An image output device in accordance with claim 39, said image output device further comprising:

a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group.

**Claim 41 (Original):** An image processing device that makes image data subjected to a preset series of image processing and generates the processed image data as control data, which is supplied to an image output device to control creation of dots and form an output image,

said image processing device comprising:

a pixel group tone value specification module that specifies a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group;

a dot number data generation module that refers to a first correlation map to generate dot number data of each pixel group, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

an ordinal number storage module that stores ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group; and

a control data generation module that refers to a second correlation map to determine a dot on-off state in each pixel included in each pixel group with the generated dot number data and thereby generate the control data, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number.

**Claim 42 (Original):** An image processing device in accordance with claim 41, said image processing device further comprising:

a classification number allocation module that classifies pixel groups into plural different classes according to positions of the respective pixel groups in the output image and allocates the pixel group classification number to each pixel group.

**Claim 43 (Original):** An image output method that creates dots on an output medium according to image data to form an output image,

said image output method comprising:

a first step of specifying a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group;

a second step of referring to a first correlation map to generate dot number data of each pixel group, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

a third step of storing ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group;

a fourth step of referring to a second correlation map to determine a dot on-off state in each pixel included in each pixel group with the generated dot number data, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number; and

a fifth step of actually creating dots on the output medium according to a determination result of the dot on-off state in the number of pixels.

**Claim 44 (Original):** An image processing method that makes image data subjected to a preset series of image processing and generates the processed image data as control data, which is supplied to an image output device to control creation of dots and form an output image,

said image processing method comprising:

a step (A) of specifying a pixel group tone value as a representative tone value of each pixel group, which is provided by collecting a preset number of plural pixels among a number of pixels constituting the image, according to image data of individual pixels in the pixel group;

a step (B) of referring to a first correlation map to generate dot number data of each pixel group, where the first correlation map correlates dot number data of each pixel group, which represents number of dots to be created in the pixel group, to each combination of a pixel group classification number allocated to the pixel group and the specified pixel group tone value of the pixel group;

a step (C) of storing ordinal numbers of respective pixels included in each pixel group as a priority order of dot creation in the pixel group; and

a step (D) of referring to a second correlation map to determine a dot on-off state in each pixel included in each pixel group with the generated dot number data and thereby generate the control data, where the second correlation map correlates each combination of an ordinal number and a value of the dot number data to a dot on-off state in a pixel having the ordinal number.

**Claims 45 and 46 (Canceled).**